Aging Aircraft National Strategy

Joint Council on Aging Aircraft

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Agenda

- *"The problem"*
- **JCAA Background**
- **National Strategy**
- **JCAA and Industry Scorecard**
- **Summary**

JCAA Membership

Joint Council on Aging Aircraft

Fleet-Wide Aircraft Age Trend*

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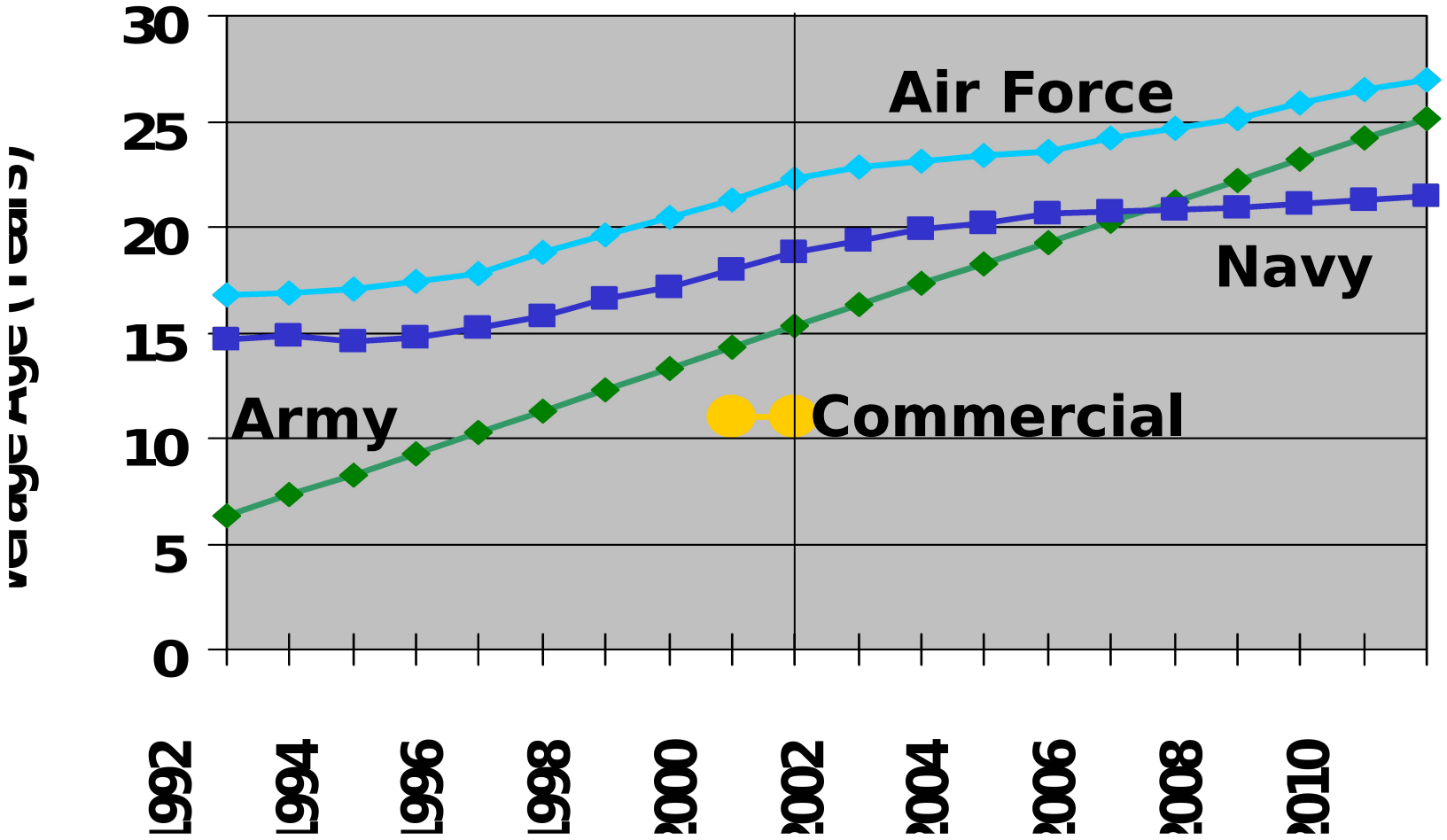
*Data based on 2001 figures



Differences in business operating rules readily apparent

Agenda

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JCAA Mission

Joint Council on Aging Aircraft

- **Jointly Identify, Investigate, and Implement Programs that will Field Products to Improve the *Availability* and *Affordability* of all the Services' and Agencies' Aging Aeronautical Systems**

Organizing for Action in JACG

Joint Council on Aging Aircraft

Joint Program Opportunities Board (JPOB)
Joint Aeronautical Armaments Board (JAAB)
Aviation Engineering Board (AEB)
Aviation Business Process Board (ABPB)
Aviation Logistics Board (ALB)
Science and Technology Board (S&T)
Joint Technical Coordinating Group on Aircraft
Survivability (JTCG/AS)
Joint Council on Aging Aircraft (JCAA)

USAF - Aging Aircraft Program Manager
USA - Director for Transformation
USN - Aging Aircraft Program Director
DLA - Aging Aircraft Program Manager
FAA - Aging Aircraft Director
USCG - Aging Aircraft Branch Chief
USMC – HQMC Dept of
n
Langley

JCAA: A JLC/JACG Chartered Board

AIA/NDIA/JCAA Interface

JCAA Joint Council on Aging Aircraft

JCAA Expanded to Include Industry Representatives

- Logistics Mgmt Division
- System Eng Division
- Product Support
- Engineering Management

NDIA

Resources
- IEEE
- SAE
- EIA
- AIAA
- AVSI
- RITA
- Other

Strategic & Tactical Initiatives

Two Way Flow of Ideas

JCAA Approach

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- **Through the use of Integrated Roadmaps, Shared Data and Analyses, the JCAA will:**
  - **Identify Process Recommendations & Improvements**
  - **Advocate/Enable Promising Technology**
  - **Facilitate Transition of Technology/Program Opportunities**
  - **Promote Knowledge Management on Aging Aircraft**
  - **Coordinate Funding for Promising Areas**

Value Added: Integrated Roadmaps, Coordinated Funding, And Knowledge Sharing

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Why a "National Strategy"?

- **Resources are limited**
  - USN FHP $2B/yr with 7.8% growth
  - 4:1 ROI requires $160M/yr investment
  - USN AA budget tops at $7M/yr
- **Solutions are fragmented**
  - Many different approaches; many competing
  - Funding not "balanced"
    - Lack of transition and support $
- **Lack of Consensus between Govt/Ind**
  - Are we incentivizing the right motives?

Work Smarter not Harder

National Strategy – *What is it?*

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- **12 Over arching Recommendations**
  - **Process**
  - **Critical Gaps**
  - **Not a "whine for funding"**
- **Organized around 5 JCAA Steering Groups**
  - **Detailed Roadmap of funded efforts/gaps**
- **Industry Interaction/Input Vital**

- Top 12 Issues Presented at Aging Aircraft Confere
- Detailed Sections Available 11/30
- Complete Report to industry 12/31

JCAA Joint Council on Aging Aircraft

National Strategy *Outline*

Chapter 1 –

Overview

Chapters 2-6

Detailed Discussion

Gaps/Issues

Chapter 7

Recommendations

	99	00	01	02	03	04	05	06	07	$	S	P	Holes
2.0 Science and Technology													
2.1 Circuit Protection	1390	1570	1810	1115	700	700	800						
2.1.1 Arc Fault Circuit Breaker (First Generation) J	695	785	905	90									
Navy FNC TOC	455	535	505	90									
FAA Development	240	250	400										
2.1.2 Arc Fault Circuit Breaker (Second Generation) J				825	700	700							
Navy FNC TOC				300	300	300							
FAA Development				400	400	400							
AF AFCI Miniaturization Study				125									
2.1.3 Arc Fault Circuit Breaker Enhancements J				200			800						
Navy Enhancement Program							800						
AF/AAA Support to Navy program				200	[200]	[200]							
2.2 Data Management													
2.2.1 Common Wiring Data System C													
Navy Maintenance Code Improvement Implementation			25	25	25								
AF maintenance data analysis			75										
2.2.2 Common Maintenance Repair Information System C													
Navy Just In Time Wiring Information System (JITWIS) eBusiness Initiative					500								
2.3 Failure Modes and Effects													
2.3.1 Wire System Aging Study I													
AF Field Study		100											
AF Characterization of Field Wiring				75									
AF Modeling of Wiring FA Mechanisms D09				25	100								
AF Wiring Defect Characterization					50	100	100	100	100				
AF Advanced Failure Characterization						[300]	[300]	[400]	[400]				
AF Advanced Modeling						[150]	[250]	[300]	[300]				
FAA Wire Degradation Study													
2.4 Maintenance and Design Tools													
2.4.1 Risk Assessment Methods and Tools C													
FAA Advanced Risk Assessment Techniques													
AF/AA wiring strategic plan				100	100								
Navy Risk Assessment Process Development					50	100	100						
2.4.2 Advanced Maintenance Tools													
AF Advanced Maintenance Concepts D09					200								
AF Wire Repair Study				50									
Advanced Maintenance Tools						[500]	[500]						
AF Advanced Repair Technologies					100	50	[400]	[400]					
Navy MCH-100 Battery Operated Heat Gun Technology Insertion					[20]								
2.5 Materials													
2.5.1 Advanced Wire Insulation I													
AF Advanced Polymer Synthesis D09				50									
AF Advanced Insulation Evaluation D09					100								
AF Advanced Insulation Scale Up						[200]	[300]	[500]	[600]				
Navy Next Generation Wire Evaluation					[100]	[200]	[200]						
2.5.2 Advanced Wire Polymers I													
AF phase II SBIR Development of Conductive Polymer			300										
AF Add-on to SBIR				50									
AF Evaluation of polymer wiring D09					50								
AF Polymer wiring scale-up						[300]	[700]	[800]	[500]				
2.5.3 Corrosion Prevention Compounds and Materials C													
AF Evaluation of CPC's for electronics					100								
Navy Evaluation of CPC's for Connectors						10							
2.6 Wiring Diagnostics													
2.6.1 On-Board Diagnostics													
2.6.1.1 Smart Wiring C		235	590	1840	2760	750							
Navy 6.2 Smart Wire Program (Management Sciences/USU)		235	590	565									
Navy 6.3 Smart Wire Program (GE, Eclypse, Lockheed)				900	800	600							
Navy Qualification Testing (ONR)						[50]	[300]						

National Strategy Focus

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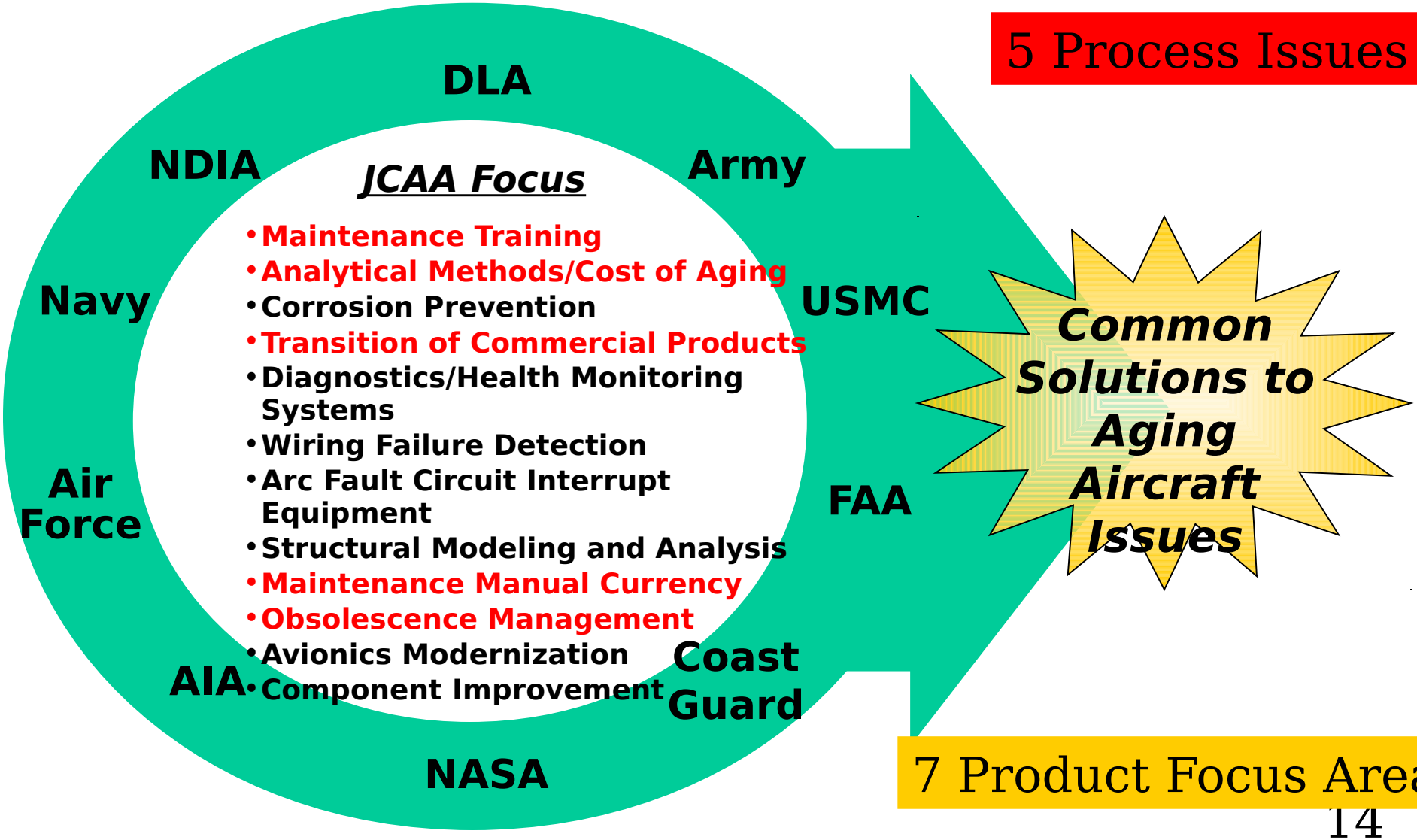

National Strategy - Cost of Aging

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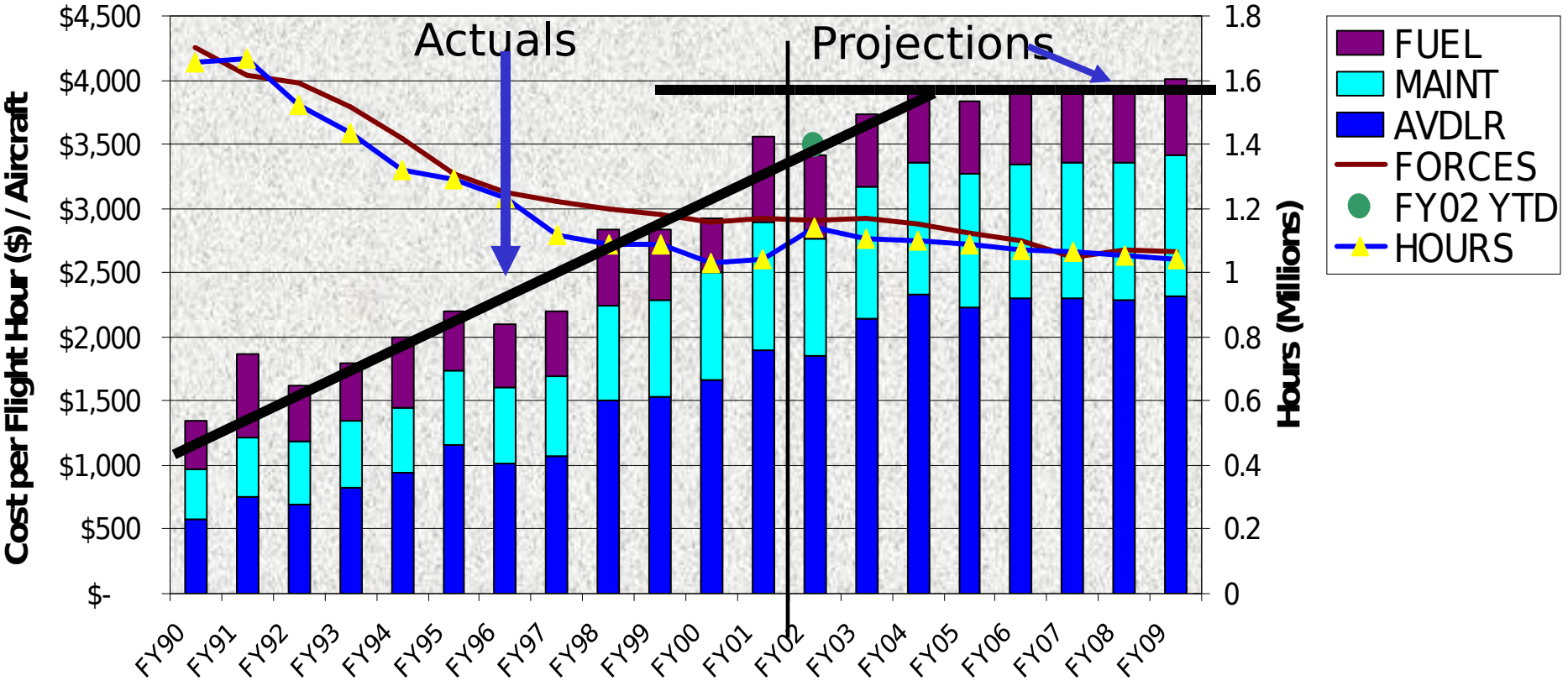

What is Driving the costs?
What can we do to mitigate the increase?

Air Force Trend Summary
131 Components Studied

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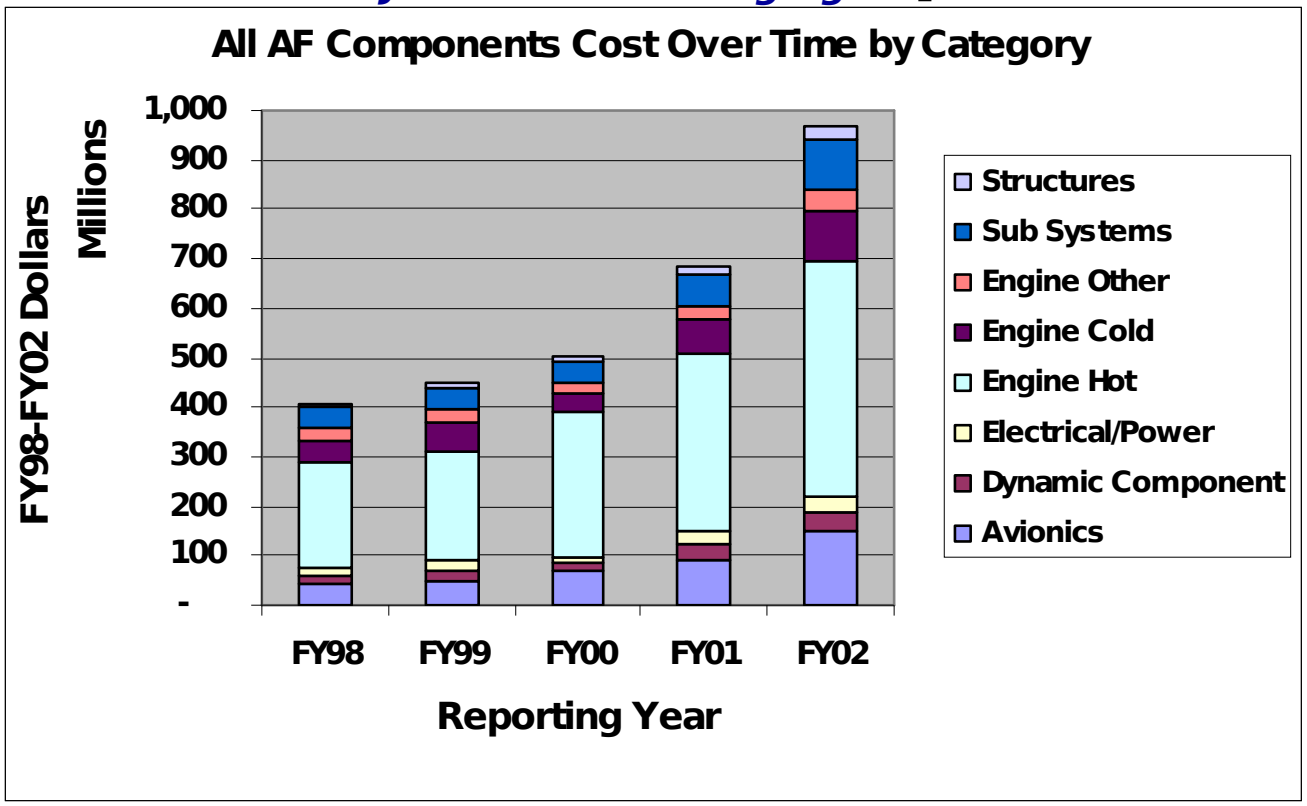

- Primary Area for Air Force Cost Growth is Engine Component Related
- No Helos or Prop Aircraft in AF DB Minimizes Dynamic Component Area
- Age, New Items and Maintenance Plan Changes All Have Significant AF Impacts
- Vendor Issues Do Not Significant Root

Root Cause Analysis	Age	Obs	Vndr	Dsgn	Log	New Item	Maint Plan
Avionics	20.5%	17.7%	5.1%	6.3%	7.5%	22.0%	20.9%
Dynamic Component	10.0%	38.0%	0.0%	14.0%	32.0%	0.0%	6.0%
Electrical/Power	0.0%	0.0%	0.0%	0.0%	10.8%	72.0%	17.2%
Engine Cold	32.2%	0.0%	0.0%	13.4%	3.4%	8.7%	42.3%
Engine Hot	48.9%	2.8%	0.0%	12.8%	0.3%	14.5%	20.6%
Engine Other	25.0%	0.0%	0.0%	27.5%	0.0%	47.5%	0.0%
Structures	66.2%	0.0%	0.0%	0.0%	22.1%	0.0%	11.8%
Sub Systems	26.5%	15.9%	5.9%	7.1%	14.7%	24.1%	5.9%

Corrosion Efforts - CPCs

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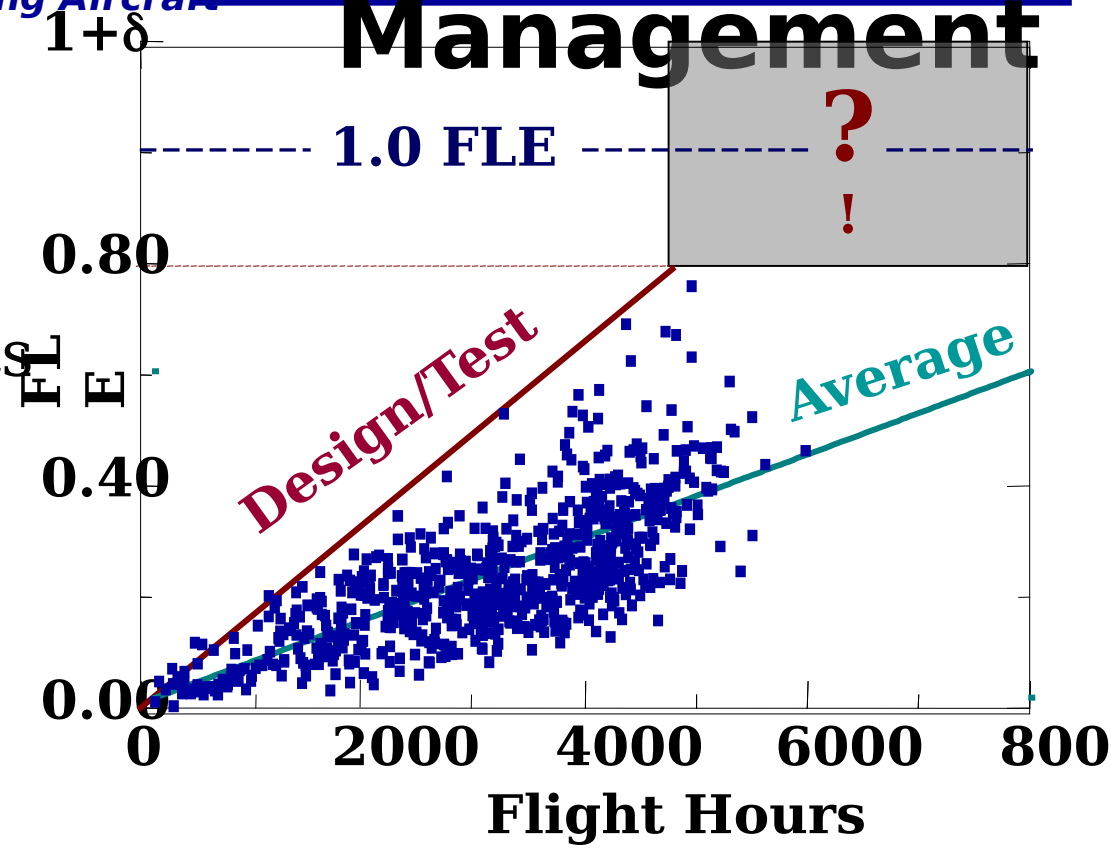
LAB ID	– Rated for corrosion Protection – Shaded – Recommended	Penetration As measured by Capillary Migration in 16"	Aged Film Characteristics (7 da. + @ 160F)	VOC	SALT SPRAY Days to Failure Steel	SALT SPRAY Days to Failure Aluminum	SO2-SALT SPRAY Days to Failure Aluminum	SSSA SPRAY Cycles to Failure Steel
	OILY FLUID FILMS (foggable?)							
000627-OC-1	New Corr- X (Corrosion X Aviation)	9	Viscous Fluid	52g/l	>12, >12, 17,18	35 & 35	5, & 5	>12,>12,>12
000228-OC-11	Esgard PL-4 Class 2 Grade 4	5	Fluid	99g/l	7, 11	15 & 15		>12,>12,>12
000324-OC-2	Tectyl 511M Class 2 Grade 5	13	Fluid	335g/l	4, 4	5,10,10, & 27		3,4,4
000605-OC-1	ZC-010	10	Viscous Fluid	576g/l	<1, 2	26 & 27		2,2,3
000222OC-11	ACF-50 Type 2	9	Oily Fluid	>166.9g/l	2, 3	4 & 4		1,2,3
000316OC-1	Corrosion X	8.5	Oily Fluid	7	2,3	13 & 19		1,2,3
000228-OC-12	Esgard PL-3 Class 2 Grade 5	10	Fluid	19g/l	1, 2	5 & 7		1,1,1
	SOFT SOLID THICK FILMS							
000510-OC-5	Dinitrol AV-100	0	Soft Waxy Solid	255g/l	42, >63	> 60, >60	19 &	>12,>12,>12
000510-OC-2	Fluid Film NAS	2 (9 overnight)	Soft Waxy Film	82g/l	4, 5	> 60, >60		>12,>12,>12
000718-OC-1	Cor-Ban 27		Soft Solid	557g/l	>40	> 60, >60		>12,>12,>12
000228-OC-8	Esgard PL-1 Class 2 Grade 1	5	Soft Solid	310g/l	24, 29	> 60, >60	28 & 38	>12,>12,>12
000228-OC-4	VCI-368M Grade 1	0	Soft Solid	291-324g/l	21, 29	54 & 54	24, & 24	>12,>12,>12
000228-OC-9	VCI-369M Grade 2	0	Oily Fluid	478 g/l	18,23	> 60, >60	>4, & >4	>12,>12,>12
000324-OC-3	Tectyl 502C Class 2 Grade 2	7	Soft Waxy Solid	335g/l	5, 8	54 & >60	17, 17	>12,>12,>12
000320-OC-4	Tectyl 846 Class 2 Grade 4	9.5	Soft waxy solid	335g/l	15,19	35 & 45	>4, >4	>12,>12,>12
	SOFT SOLID THIN FILMS							
P-144	Omega 2775	9	Soft Solid	480g/l	7,8,10,11	26 & 27	5, & 5	>12,>12,>12
000324-OC-6	Tectyl 894 Class 2 Grade 3	8.5	Soft Waxy Solid	335g/l	8, 9	>60, >60	8, & 8	3,4 ,>12
000301-OC-3	Noo-Rust X-502-LS Class 1 Grade 2	10	Soft Waxy Solid	2.84lgal	8,12	47 & 54	>4, & >4	7,>12,>12
000403-OC-1	Lubriguard 97-SX-92	9	Soft Solid	500g/l	4, 5	14 & 19	>4 , & >4	10,>12,>12
000324-OC-1	AR-500	10	Soft waxy solid	478g/l	4, 4			>12,>12,>12
000605-OC-4	ZC-026	8	Soft Solid	186g/l	6	28 & 29	>4 & >4	>12,>12,>12
000605-OC-2	ZC-015	9	Soft waxy solid	514g/l	<1	6, 8, 8 & 26		1,2,3
000228-OC-6	Esgard PL-2 Class 2 Grade 2	5	Fluid Paste	<10g/l	1, 2	4 & 4		1,2,3
000228-OC-10	Esgard PL-3 Class 2 Grade 3	5	Fluid Paste	9g/l	1, 2	3 & 3		1,1,1
	ASPHALT TYPE							
000301-OC-2	Noo-Rust X-501-LS Class 1 Grade 1	7	Firm Asphaltic	3.34lgal	3,19,19, & 21	> 60, >60		>12,>12,>12
000324-OC-5	Tectyl 891 Class 2 Grade 1	4	Firm Asphaltic	335g/l	24, 26, 28, 63	>60, >60		>12,>12,>12
	FRM SOLID or PASTE							
000510-OC-4	Dinitrol AV-30	5	Dry Paste	412g/l	41, 47	> 60, >60	5, & 5	>12,>12,>12
000301-OC-1	Noo-Rust X-110 Class 1 Grade 4	10	Firm Waxy Solid	1.64lgal	19,24	32 & 33	4, & 8	>12,>12,>12
000605-OC-6	ZC-082	10	Firm waxy solid	600g/l	3	4,16, 24,&30		1,3,4
	HARD FILM TYPES							
000228-OC-3	Dinitrol AV-15 (Aerosol)	7.5	Dry Film	448g/l	4,6,7,8,14	45 & >60	5, & 5	>12,>12,>12
000605-OC-5	ZC-029	9	Hard pliable film	556g/l	3	6 & 6	>4 & >4	>12,>12,>12
000718-OC-2	Cor-Ban 35 BMS 3-23F, 3-26, 3-29	11	Hard Brittle Film	357g/l	<5			5,6,>12
000510-OC-3	Dinitrol AV-8	10	Hard Tacky film	489g/l	3, 5	15,22,33, &48		3,4,9
000614-OC-1	WB Antiguard	10	Hard, non-tacky		2, 2	7,7,8,&13		3,5,7
000605-OC-3	ZC-023	10	Hard Brittle Film	573g/l	<1	26 & 26		2,4,6
000510-OC-6	MIL-C-85054	8			1	13 & 29		1,2,2
000309-OC-1	X-329	14	Hard Pliable Film	<100g/l	<1	7 & 7		2,6,9
000228-OC-5	Process 711X	8	Tacky Firm Film	7	<1	<1		1,1,1
000228-OC-7	Process 705X	11.5	Hard Peelable Film	7	<1	<1		1,1,1
	LUBRICATING OILS							
000605-OC-8	ZC-5263	9	Oily Fluid	298g/l	1	4 & 4		1,2,2
000605-OC-7	ZC-5261	10	Oily Fluid	312g/l	2	3 & 3		1,2,2
*	Asphalt types **not** recommended due to opacity							
**	Cor Ban 35 **not** recommended due to brittle film							

Transitioning the Best Solutions

1. **Roadmap "best of breed" Corrosion Solutions**
2. **Share qualification data/experience**
   - ***USN FY-02/03 Project Savings:* Over 257,000 MMHrs**
3. **Attack "** Industry – Better Material Selection Needed **specifications**

Structural Health Management

- New Mission Requirements impose new loads spectra
- Environmental effects increase with aging
- Next generation methodology needed
  - Flexible
  - Damage tolerant



Requires:

Incorporation of WFD and crack growth methodology

Data sharing from teardowns/ load surveys

Industry Involvement Critical

Avionics Modernization

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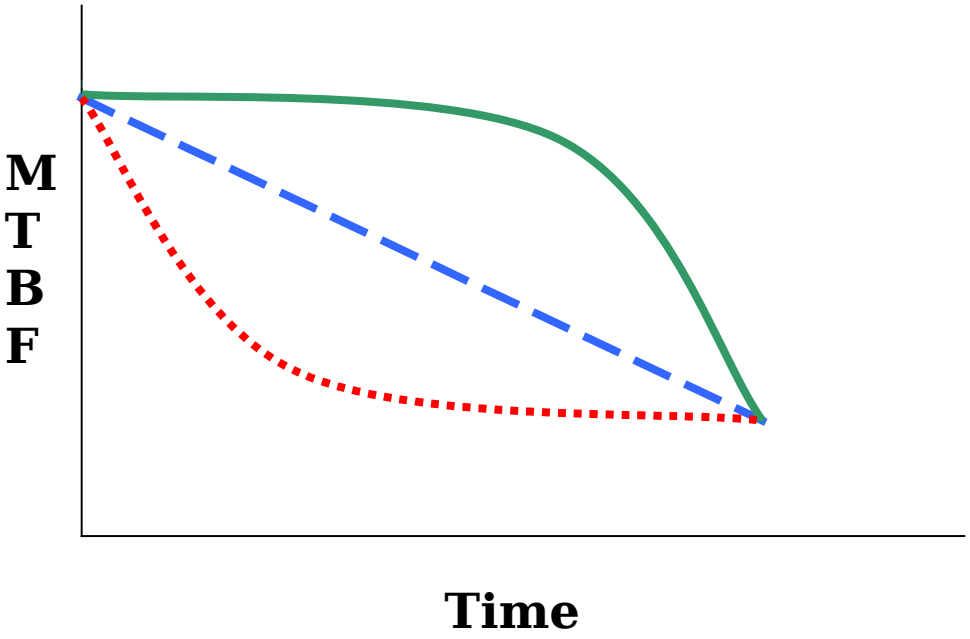
Moving to characterize avionics /COTS performance

- Predict (Manage) wear-out
- Planned Systems Improvement
- Changes in sparing?



AVSI Projects

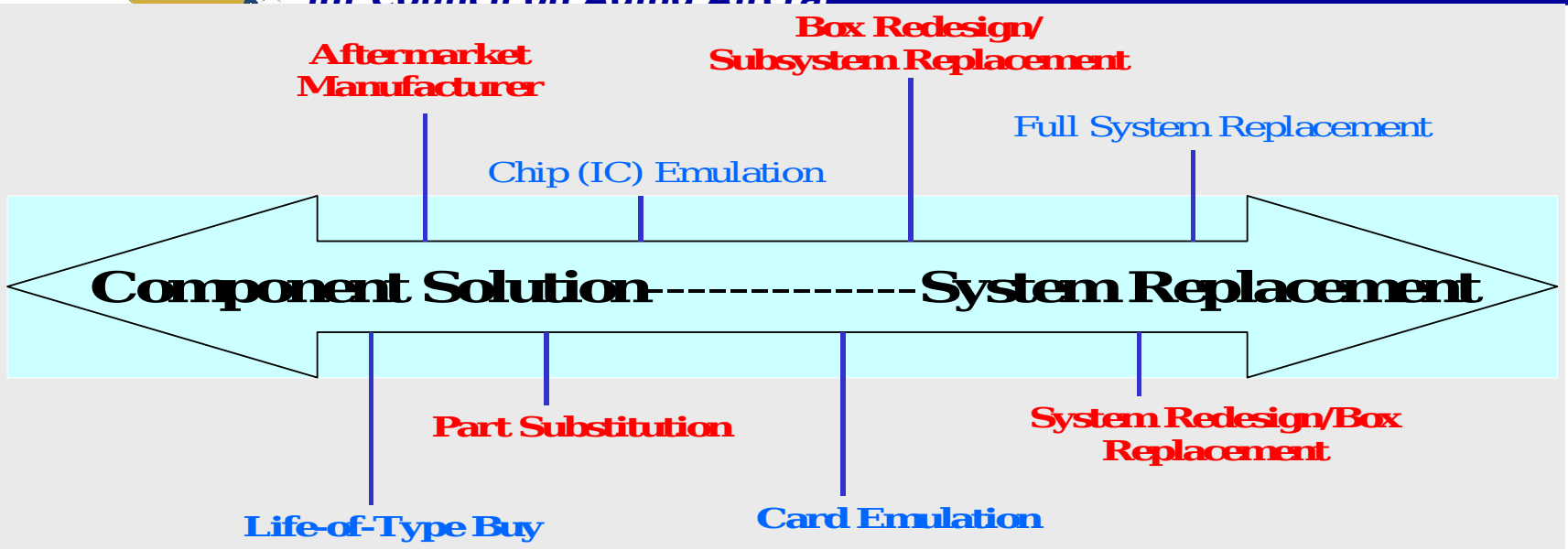
16 Mitigating Radiation Effect on Semi Conductors

17 Accelerated Wear out of Semi Conductors

18 Thermal Management of COTS Based

Understanding the new generation of compo

Avionics Modernization



Selecting the “right” option requires:

- Understanding component/system life
- Good analysis of options (ROI)
- A Valid “tool box” of options

Current Obsolescence Efforts

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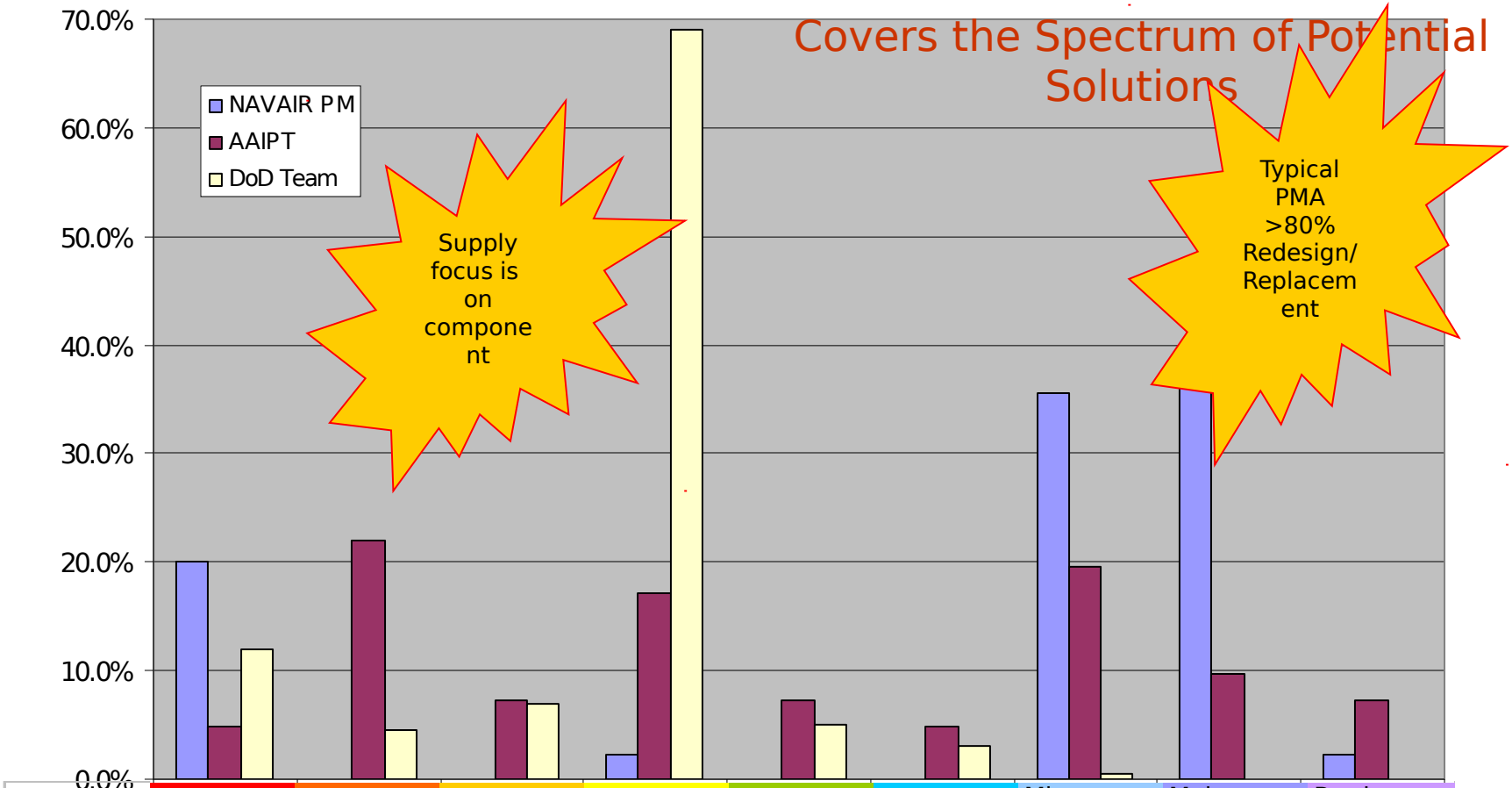
Component Solution----------System Replacement



	EOL	Source	Substitute	Alternate	Aftermarket	Emulation	Minor Redesign	Major Redesign	Replace-ment
NAVAIR PM	20.0%	0.0%	0.0%	2.2%	0.0%	0.0%	35.6%	40.0%	2.2%
AAIPT	4.9%	22.0%	7.3%	17.1%	7.3%	4.9%	19.5%	9.8%	7.3%
DoD Team	12.0%	4.5%	7.0%	69.0%	5.0%	3.0%	0.5%	0.0%	0.0%

Wiring Initiative 2 of 4

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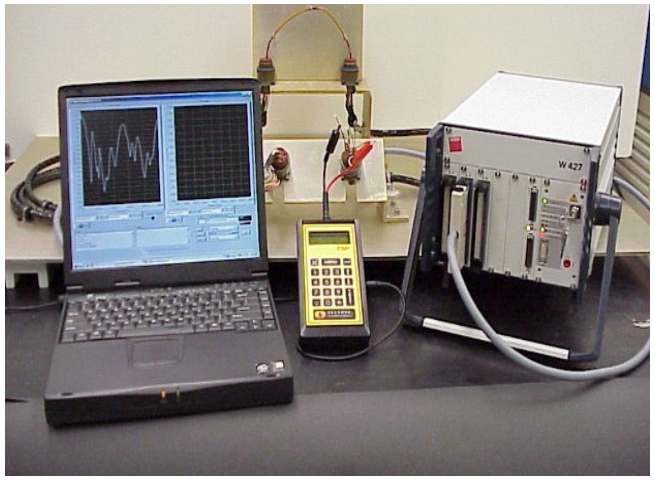
Wiring Diagnostic, Prognostic Equipment



- Objective: **Provide users with state of the art diagnostic and prognostic equipment**
- Accomplishments:
  - **Initiated Available Technology**
    - **USAF Wire Integrity Program**
      - **Re-evaluated hand held technology**
      - **Field Demonstration**
    - **Electronic Diagnosis and Characterization (ECAD) System Program – COSSI**
      - **Completed CDR**
      - **Organizational, Prognostic Evaluation**
    - **Automatic Wire Analyzer (AWA) Program NCMS CTMA (Contract Awarded) - Joint Navy, Air Force, Army Participation**
  - **Developed S&T Roadmap**
  - **Joint FAA BAA evaluation**

Common hardware specification

Roadmap For Wiring Training

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M1 M2 M3 M4 M5 M6 M7 M8 M9 M10 M11 M12 M13 M14 M15 M16 M17 M18

4.1D/3.4 Baseline Requirements

4.4.4 Technical Training Deficiency

Create Cross Functional Team
- **Wiring experts**
- **Training experts**
- **Fleet**

3.4/4.4.4 Develop Survey Baseline

Analyze Data (NALDA/MTTR/HMR) 4.4.4/4.2/3.4

Fleet Surveys

5 Communities surveyed
210 individual responses

AVWAG

Legend:
- 4.1D= Aging Aircraft IPT
- 3.4= Manpower Personnel
- 4.4.4 Electrical Systems Division
- 4.2= Cost Analysis Department

Aging Aircraft Conference

Map Issues / Curriculum Reviews

3.4/4.4.4

Final Recommendations to NAVAIR and JCAA

NAVAIR

Overall Training Survey Results

- **Underutilization of:**
  - **CNET, CANTRAC and CBT** (Training Assistance/ Tools for Feedback)
- **Unaware of:**
  - **NATEC** (Technical Assistance)
  - **New wiring malfunction codes**
- **Training Needs:**
  - **Less time between training and actual work applying it**
  - **Time to practice training / Transfer of training**
  - **Refresher training**
  - **More in-depth training**
  - **More training on:**
    - **Wire Splicing Techniques**
    - **Proper Use of Crimping Tools**
    - **Selection of Wire and Connector Tools**
    - **Recognition and Repair of Connector Corrosion**

Agenda

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JCAA Progress

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Steering Groups

- **Established**
- **Expanding**
- **Resource Limited**

Strategic Thrusts

- **Less progress**
- **More groups involved**

Funding

- **Limited**
- **Complimentary**

Steering Group	Organized	Roadmaps	Funding	FY-03 Projects Transitioned
Corrosion				3
Wiring & Power				1*
Avionics				2*
Dynamic Components				1*
Structures				
Strategic Thrusts				
Cost of Aging				1
Obsolescence				
Training				*
Pubs/Data				*

Consensus being Reached; Cultural Change Required

JCAA/NDIA Interaction

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- **Working Well**
  - NDIA involvement in day to day business
  - Participation in weekly phone call
  - All JCAA meetings
- **On Track**
  - National Strategy
    - Plan for discussion of “Strategy”
- **Needs Improvement**
  - Industry Concerns
  - Organizing various Initiatives
  - OSD Support

Aging Aircraft Conference

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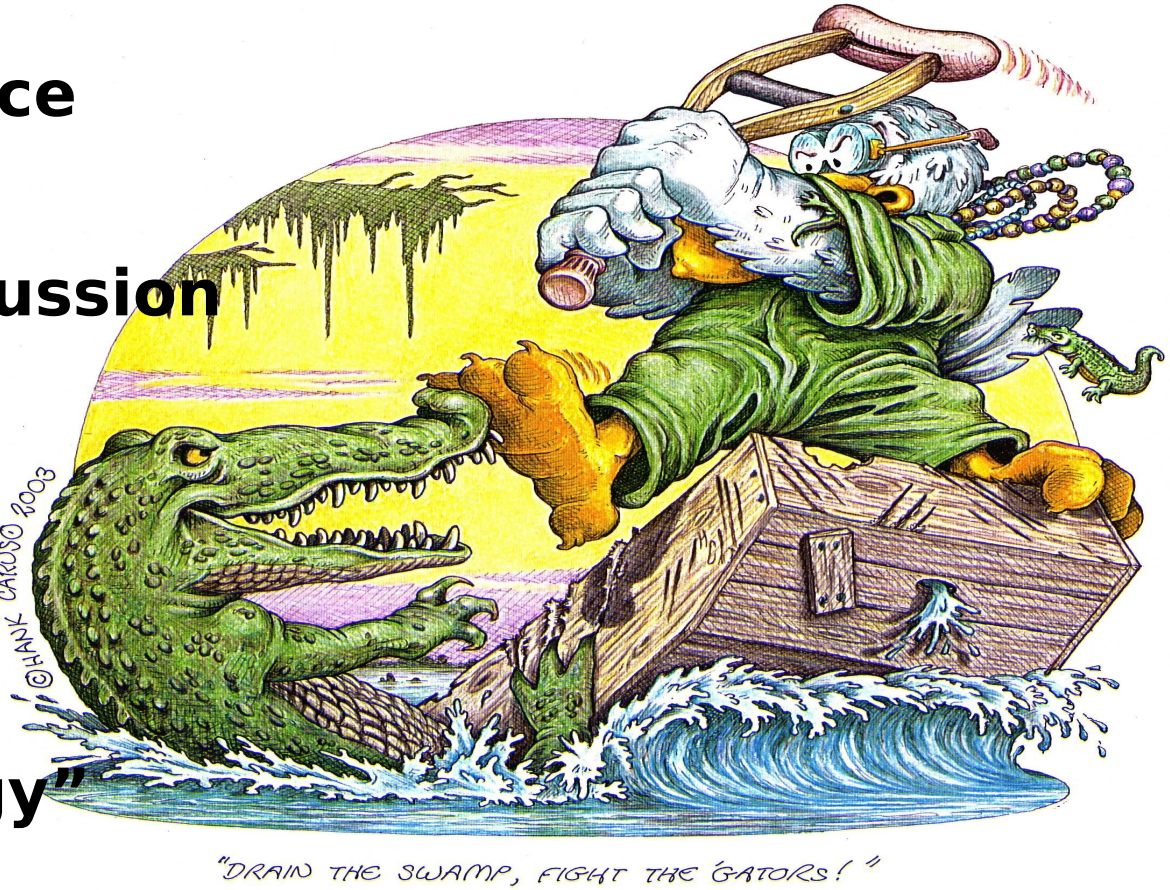
2003 AA Conference

- **950 attendees**
- **JACG panel discussion**
  - **Structures**
  - **wiring**
  - **avionics**

Unveiling of the

“National Strategy”



Next Conference 31 Jan 2005
Palm Springs CA

Agenda

Joint Council on Aging Aircraft

- "The problem"
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- ***Summary***

Where can industry help?

- **Air Vehicle**
  - Structural Health Management (crack growth…)
  - Corrosion Preventative Compound Development
  - CPC transition (legacy/new)
- **Avionics**
  - Understanding of component life
  - Development (and use) of obsolescence “tool box”
  - Common parts selection/management processes
- **Wiring**
  - Technology development/utilization
  - Best practices standardization

Summary

- **JCAA is Active & Maturing**
  - **Limited by Service/Agency resources**
  - **FAA, NASA involvement increasing**
  - **Increasing consensus on issues**
  - **Collaboration on funding**
- **Added Emphasis on Subsystems/Dynamic Components**
- **Industry Participation Improves/Accelerates Progress**
  - **Excellent support from AIA**
- **National Strategy will force discussion**
  - **Central Office Stand Up will facilitate**
- ***Strategic Progress Requires Extensive Collaboration***

JCAA-Industry Collaboration is Crucial

Obsolescence Barriers

- **Lack of Standardized Process**
  - ***Consistent/Defendable Thresholds***
- **Tools/handoff between process steps**
- **Fragmented Funding**
  - ***What Changes need to take Place?***
- **Limited Metrics**
  - ***Cost/Reliability/ROI***
- **Standardized Qualification Criteria**
- **What Data do we Buy?**